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BIOLOGICAL EVALUATION OF SPRUCE BUDWORM  
ON THE CHEQUAMEGON NATIONAL FOREST

By Imants Millers and Glen W. Erickson

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ABSTRACT

A spruce budworm, Choristoneura fumiferana (Clem.), outbreak was reported on the Hayward Ranger District, Chequamegon National Forest. Aerial surveys failed to determine the outbreak boundaries. Ground surveys indicate that the budworm is present in an area covering about 4 townships (92,000 acres), of which less than 1/4 is spruce-fir type. Severe defoliation was found in only 2 stands. The egg-mass survey indicates that the 1970 defoliation will decline. The Forest Manager is advised that chemical control is not necessary, but all field personnel should report any new areas of defoliation.



## INTRODUCTION

The spruce budworm, Choristoneura fumiferana (Clem.), is one of the most devastating insect pests of spruce-fir forests in North America. Blais (1968) reviews spruce budworm outbreak history during the last 250 years. In Wisconsin, the spruce budworm has not been a major problem. Some spruce budworm activity in northern Wisconsin was reported during the early 1950's, but no suppression was required. On the Chequamegon National Forest the spruce budworm appears to be a newcomer among the pests.

First indications in 1969 of spruce budworm on the Forest came from 2 surveillance reports--one from the Hayward Ranger District and the other from North Central Forest Experiment Station staff. After the potential seriousness of the problem was established, a defoliation and egg-mass survey was made during mid-August, 1969 to delineate the area of infestation and to predict 1970 defoliation.



## BIOLOGICAL REVIEW

### Causal Agent

Spruce budworm, Choristoneura fumiferana (Clem.)

### Host Trees Attacked

Balsam fir, Abies balsamea (L.) Mill.

White spruce, Picea glauca (Moench.) Voss

### Type of Damage

Damage occurs as a result of larval feeding on needles and mining of buds. Current foliage and buds are damaged first. Older foliage is damaged after the preferred food supply is exhausted. Severe defoliation for 3 or more successive years results in tree mortality (Bean and Waters, 1961).

### Ecological Considerations

Many parasites, predators and diseases attack the spruce budworm, but their role in outbreak suppression appears to be minor. (Bean and Waters, 1961; Morris et. al., 1963). Adverse weather has been reported as a mortality factor elsewhere (Wellington, 1954).

## SURVEY METHODS

### Aerial Survey

Aerial reconnaissance was made in early August after the spruce budworm infestation was affirmed. Attempts to sketch-map the area of defoliation were unsuccessful because all the dead needles had fallen. Even where nearly complete defoliation of current foliage had occurred, the damage could not be recognized visually at 100 feet above tree tops.

### Defoliation Survey

Samples were taken from clusters of trees (plots) in areas selected from type maps. The selection was based on



the abundance of fir type and accessibility by car (Map 1). Each sample consisted of three 15" long fir twigs taken from the mid-crown of each of 3 trees (9 twigs per cluster). All 41 clusters, except one, were balsam fir; white spruce was used for cluster number 20. The sample twigs were cut, tagged and brought to the Toumey Nursery for examination.

Defoliation was estimated for each twig and recorded as one of 5 classes:

Class	Current Defoliation
0	None
1	1/4
2	1/2
3	3/4
4	Completely, or nearly so

The intensity of defoliation (Table I) for a cluster was determined from an average defoliation class derived from the 9 twigs. Two factors, other than the spruce budworm, influenced the defoliation estimates: 1. shoots killed by frost could be mistaken for defoliation, 2. excessive drying of twigs caused some loss of foliage. However, none of the errors were sufficient to cause a defoliation over-estimate greater than 1 class.

At the same time, the number of egg-masses per twig were determined. Because of low egg-mass populations in the area of severe defoliation, several trees were cut and egg-mass distribution within the total crown area examined. The original assumptions for mid-crown sampling were not disproved--simply, the egg-mass populations were low.

## RESULTS AND DISCUSSION

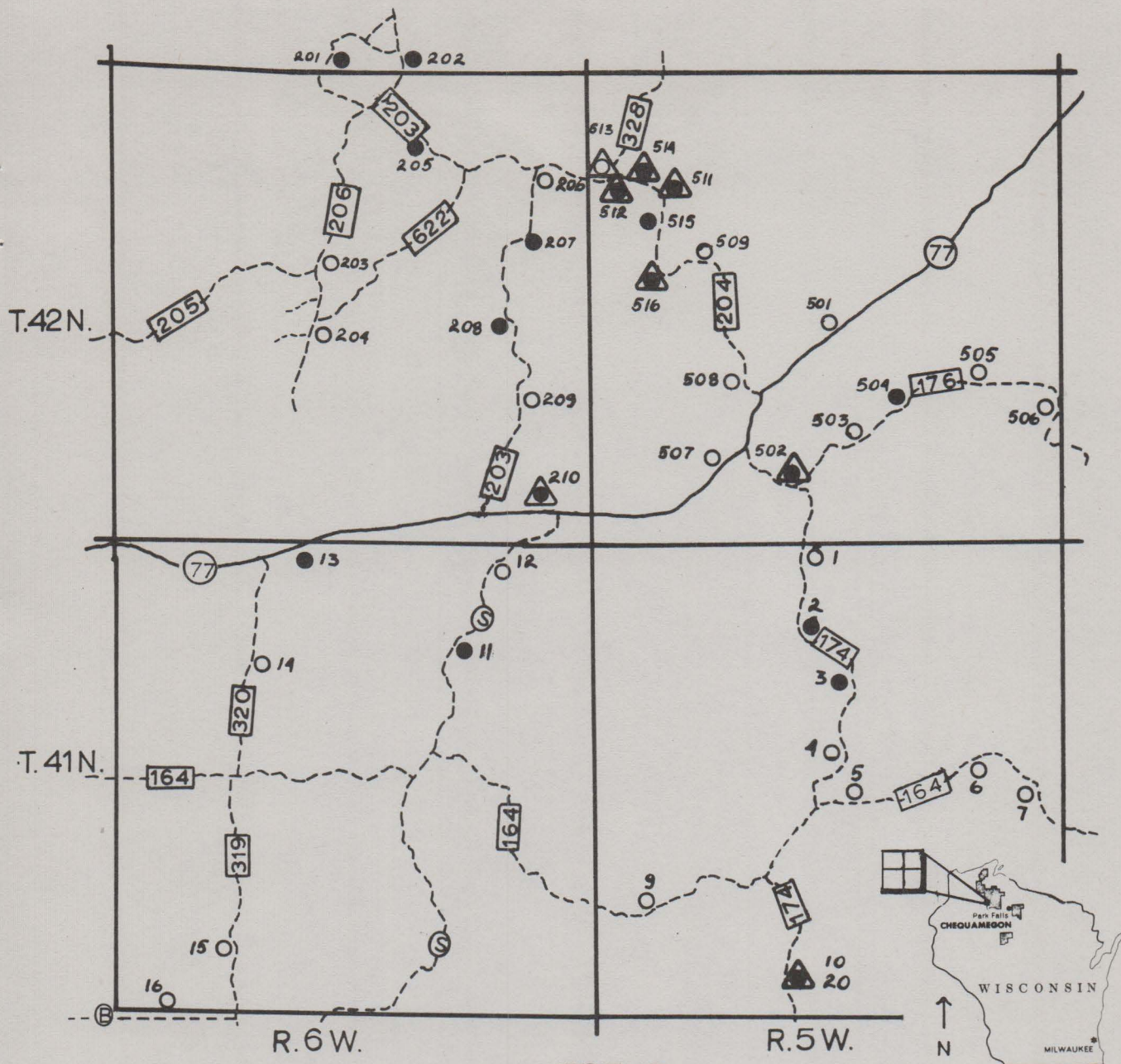
Since the defoliation was not visible from air, the area of defoliation was determined from ground survey. The spruce budworm is present in an area about 4 townships, or 92,000 acres (Map 1). However, the susceptible host type occupies less than 1/4 of the area. The solid circles on the map show plots where defoliation was present.



In general, defoliation was light; 2 plots had no defoliation, and 20 had some defoliation, but only 2 plots had more than 1/2 of current foliage removed (Table I).

The results of egg-mass survey indicate that next year's defoliation probably will decrease (Table I). Only 2 plots have egg-mass populations that may be considered high (0.9 e.m. per twig). No explanation is available for the absence of eggs in the plots where defoliation was present. Most of them had pupal exuviae to indicate adult emergence. Since this is the first spruce budworm outbreak in recent years, we are hesitant to predict the course of the outbreak. However, severe defoliation over a large area is not expected. Thus, the logical recommendation is to follow the outbreak developments and postpone chemical control until tree damage is anticipated.





### LEGEND

#### ROADS

- [205] -- Forest road
- S --- County road
- (77) --- State highway

Scale: 1/2" = 1 mile

1-516

#### BUDWORM PLOTS

- O No defoliation, no eggs
- Defoliation present, no eggs
- △ No defoliation, eggs present
- ▲ Defoliation present, eggs present

Map 1. Spruce budworm defoliation and egg-mass populations on the Hayward Ranger District, Chequamegon National Forest.



TABLE I. Spruce budworm egg-mass populations and defoliation intensity on the Hayward Ranger District, Chequamegon National Forest

Plot Number	T	R	S	Egg-Masses Per Twig	Intensity of Defoliation <sup>1/</sup>
1	41	5	4	0	0
2	41	5	9	0	.1
3	41	5	10	0	.2
4	41	5	15	0	0
5	41	5	22	0	0
6	41	5	14	0	0
7	41	5	24	0	0
9	41	5	30	0	0
10	41	5	33	.2	1.4
11	41	6	11	0	.1
12	41	6	2	0	0
13	41	6	4	0	.2
14	41	6	8	0	.1
15	41	6	32	0	0
16	41	6	31	0	0
20	41	5	33	1.2	1.1
201	43	6	33	0	.9
202	43	6	34	0	.9
203	42	6	16	0	0
204	42	6	21	0	0
205	42	6	3	0	.4
206	42	6	12	0	0
207	42	6	13	0	.7
208	42	6	24	0	.4
209	42	6	25	0	0
210	42	6	36	.1	1.2
501	42	5	22	0	0
502	42	5	33	.1	.1
503	42	5	27	0	.7
504	42	5	27	0	0
505	42	5	23	0	0
506	42	5	25	0	0
507	42	5	29	0	0
508	42	5	20	0	0
509	42	5	17	0	0
511	42	5	7 SE,NE	1.0	3.2
512	42	5	7 SE,NW	.3	1.0
513	42	5	7 SW,NW	.1	0
514	42	5	7 SW,NE	.1	.4
515	42	5	7 SE,SE	0	2.2
516	42	5	18	.1	.1

<sup>1/</sup> Expressed as the average class of defoliation (Pg. 2).



RECOMMENDATION

1. No chemical suppression is recommended on the basis of the present budworm situation.
2. The St. Paul Office will continue observations on the outbreak area. Defoliation and egg-mass surveys are planned for 1970.
3. All National Forest field going personnel should report new outbreak areas as soon as they are detected. Use Form 5200-1.

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